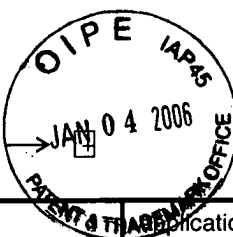


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HDP/SB/21 based on PTO/SB/21 (08-00)

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# TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	10/608,086
Filing Date	June 30, 2003
Inventor(s)	William E. RUSSELL, II et al.
Group Art Unit	3641
Examiner Name	Rick Palabrica
Attorney Docket Number	24GA05998-7

## ENCLOSURES (check all that apply)

<input type="checkbox"/> Fee Transmittal Form <input type="checkbox"/> Fee Attached <input type="checkbox"/> Amendment <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s) <input type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input type="checkbox"/> Information Disclosure Statement <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Response to Missing Parts/Incomplete Application <input type="checkbox"/> Response to Missing Parts under 37 CFR 1.52 or 1.53	<input type="checkbox"/> Assignment Papers (for an Application) <input type="checkbox"/> Letter to the Official Draftsperson and _____ Sheets of Formal Drawing(s) <input type="checkbox"/> Licensing-related Papers <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____	<input type="checkbox"/> After Allowance Communication to Group <input checked="" type="checkbox"/> REPLY BRIEF (w/clean version of pending claims) <input type="checkbox"/> Appeal Communication to Group (Notice of Appeal) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input type="checkbox"/> Other Enclosure(s) (please identify below):		
<table><tr><td>Remarks</td><td></td></tr></table>			Remarks	
Remarks				

## SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Harness, Dickey & Pierce, P.L.C.	Attorney Name	Reg. No.
		Gary D. Yacura	35,416
Signature			
Date	January 4, 2006		

(HDP Ref: 8564-000045/US/DVA)



PATENT APPLICATION

IN THE U.S. PATENT AND TRADEMARK OFFICE

Appellants: William E. RUSSELL, II, et al.  
Application No.: 10/608,086  
Art Unit: 3641  
Filed: June 30, 2003  
Examiner: Ricardo Palabrica  
For: SYSTEM AND METHOD FOR CONTINUOUS  
OPTIMIZATION OF CONTROL VARIABLES DURING  
OPERATION OF A NUCLEAR REACTOR  
Attorney Docket No.: 24GA05998-7  
(HDP Ref: 8564-000045/US/DVA)

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**REPLY BRIEF UNDER 37 C.F.R. § 41.41**

Customer Service Window  
Randolph Building  
401 Dulany Street  
Alexandria, VA 22314  
**Mail Stop Appeal Brief - Patents**

January 4, 2006

Sir:

Responsive to the Examiner's Answer mailed November 8, 2005,

Appellants supply the following arguments in reply.

**I. REAL PARTY IN INTEREST:**

Appellants note the Examiner's recognition of the real party in interest.

**II. RELATED APPEALS AND INTERFERENCES:**

Appellants note the Examiner's recognition that no known appeals or interferences are related to the subject appeal.

**III. STATUS OF CLAIMS:**

The status of the claims remains as set forth in the Appeal Brief. Namely, the status of the claims is as follows:

Claims 31-41 are pending in the application, with claim 31 being written in independent form.

Claims 31-39 remain finally rejected under 35 U.S.C. § 102b as being anticipated by Takeuchi.

Claims 31-39 remain finally rejected under 35 U.S.C. § 102b as being anticipated by Musick.

Claims 40-41 remain finally rejected under 35 U.S.C. § 102b as being anticipated by Takeuchi.

Claims 40-41 remain finally rejected under 35 U.S.C. § 103 as being unpatentable over Musick in view of Takeuchi.

Claims 31-41 are being appealed.

**IV. STATUS OF AMENDMENTS:**

Appellants note with appreciation the Examiner's confirmation that the status of amendments set forth in the Appeal Brief is correct.

**V. SUMMARY OF CLAIMED SUBJECT MATTER:**

Appellants note with appreciation the Examiner's indication that the Summary of the Claimed Subject Matter set forth in the Appeal Brief is correct.

**VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL:**

The grounds of rejection to be reviewed on appeal remains as set forth in the Appeal Brief. Namely, the grounds of rejection are as follows:

Appellants seek the Board's review of (1) the rejection of claims 31-39 under 35 U.S.C. § 102b as being anticipated by Takeuchi; (2) the rejection of claims 31-39 under 35 U.S.C. § 102b as being anticipated by Musick; (3) the rejection of claims 40-41 under 35 U.S.C. § 102b as being anticipated by Takeuchi; and (4) the rejection claims 40-41 under 35 U.S.C. § 103 as being unpatentable over Musick in view of Takeuchi.

**VII. ARGUMENTS:**

**A. Appellants traverse the rejection of claims 31-39 under  
35 U.S.C. §102b as being anticipated by Takeuchi.**

Claims 31-39 rise and fall together.

**i) Claim 31**

With respect to the rejection of claim 31 based on both Takeuchi and as later discussed below with respect to the Musick patent, the Examiner correctly characterizes one of the fundamental issues for this appeal on page 10 of the Examiner's Answer. Specifically, that issue is whether the prevention of abnormal operational events by the expert system of Takeuchi or the supervisory system of Musick constitutes optimization of reactor operation. As the Examiner has set forth, Appellants say it does not, while the Examiner contends that it is.

In the Examiner's Answer, the Examiner reiterates the plain and ordinary definition for the term "optimization." This definition is given as:

"[A]n act, process or methodology of making something (as a design, system or decision) as fully perfect, functional or effective as possible." (see Merriam Webster's Collegiate Dictionary, 10<sup>th</sup> edition, 1993).

Page 3 of the November 7, 2005 Examiner's Answer.

Appellants do not necessarily object to the Examiner's definition of optimization, but do object to the application of this definition; particularly,

at it has been applied to the Takeuchi and Musick patents. According to the definition supplied by the Examiner, optimization requires making something as fully perfect or fully functional as possible. As already admitted by the Examiner, Takeuchi determines whether there is evidence of an abnormal reactor condition, determines the seriousness of the condition, and predicts future effects of the abnormal condition. It is then left to an operator to use the information on the abnormal conditions sensed to correct the problem by maintaining the plant within specified safety limits and avoid reactor shutdown. At best, this can be characterized as making the reactor barely functional to prevent the reactor from becoming non-functional. This can hardly be characterized as making reactor operation as fully functional or fully perfect as possible.

Appellants also reiterate that the optimization process is performed on one of a computer and computer network and is not the result of only operator control as taught in Takeuchi. In the Examiner's Answer, the Examiner states that Appellants apparently object to having the operator be part of the optimization process as in the case of Takeuchi. The Examiner goes on to state that the claims recite open-ended transitional terms such as "comprising" and therefore does not exclude additional or unrecited elements. While on its face, the Examiner's statement regarding "comprising" is true, the claims still require that the optimization operation be performed by a computer or computer network. As a result, this

precludes performing the optimization operation solely by operator involvement. Takeuchi only alerts the operator of an abnormal condition, and it is then up to the operator to make adjustments. Accordingly, even if the Examiner wants to characterize these adjustments as optimization, which Appellants strongly disagree, these adjustments are performed by the operator and not by a computer or computer network.

In the Examiner's Answer, the Examiner also makes the assertion that:

Takeuchi et al.'s system inherently generates one or more independent control variable values (e.g., increasing values of containment radiation level during an abnormal event) as part of future effects prediction.

Page 7 of the November 7, 2005 Examiner's Answer

Appellants respectfully disagree with the Examiner's assertion. There is no basis in the Takeuchi patent for the Examiner's assertion. It is a well-known tenet of patent law that the inherency of a feature is something that must follow, not something that might or could happen. See In re Oelrich, 666 F.2d 578, 212 USPQ 323 (CCPA 1981) and Continental Can v. Monsanto, 948 F.2d 1264, 20 USPQ2d 1746 (Fed. Cir. 1991).

Takeuchi only discloses predicting future effects of the abnormal circumstances, namely providing plant condition data. There is no disclosure of generating plant control variable values. Furthermore, the Examiner's example of containment radiation level is given as an example

of plant operation data, and Takeuchi discloses that this is obtained from operational units 12a-12n.<sup>1</sup> There is no disclosure or suggestion in Takeuchi that the expert system changes the plant operation data such as containment radiation level. Instead, as is further described in columns 5 and 6 of Takeuchi, this information is acquired from the operational units. In fact, Takeuchi goes so far as to say that the data acquisition system 14 must monitor the operational units 12a-12n.<sup>2</sup>

**ii) Claims 32-39**

Claims 32-39, dependent on claims 31, are patentable at least for the reasons stated above with respect to claim 31 as well as on their own merits.

**B. Appellants traverse the rejection of claims 31-39 under  
35 U.S.C. § 102b as being anticipated by Musick.**

Claims 31-39 rise and fall together.

**i) Claim 31**

As stated above, one of the primary issues involved in this appeal is whether or not prevention of abnormal operational events by the

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<sup>1</sup> Column 2, lines 25-46.

<sup>2</sup> See column 6, lines 51-56.



supervisory system of Musick constitutes optimization of reactor operation. As will be recalled from the Appeal Brief<sup>3</sup>, Musick discloses in column 23, lines 40-47 that the core operating limit supervisory system (COLSS) calculates a reactor core operating limit, and that this limit provides a sufficient margin to the design limits to allow the core protector calculator to respond to an incident and terminate the reactor core chain reaction before the design limits are violated.

On page 5 of the November 7, 2005 Examiner's Answer, the Examiner characterizes Musick by stating:

Based on some sensor signals, COLSS makes an accurate calculation of a DNBR operating limit that can be utilized to control reactor operation: a) register the limit on visual indicator 170 to allow an operator to operate the reactor within specified limits; and 2) automatically restrict the plant power within limits (see col. 12, lines 8+).

As this discussion reveals, Musick provides for rendering the reactor non-functional, or at the very most, barely functional. This can hardly be characterized as optimization, which according to the Examiner's definition would make reactor operation fully perfect or fully functional.

In attempting to support his position, the Examiner directs Appellants' attention to col. 8, lines 24+ of Musick.<sup>4</sup> This portion of Musick recites:

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<sup>3</sup> See page 15 of the October 18, 2005 Appeal Brief.

<sup>4</sup> See page 3 of the November 7, 2005 Examiner's Answer.

In the art of reactor control, the objectives to be achieved are the maximization of plant capacity and availability without violating the specified acceptable fuel design limits as a result of abnormal operation and anticipated operational occurrences.

Musick, contrary to the Examiner's assumption, is not directed towards maximizing plant capacity and availability. Instead, Musick is directed towards the latter part of the above quotation, which is to say that Musick is concerned with detecting violation of specified acceptable fuel design limits. This is further supported in col. 5, lines 57-60 of Musick in which it is stated that:

The instant invention involves a supervisory apparatus and method whose function is to ensure that a nuclear reactor is operated within specified operating limits.

Therefore, Appellants would like to reiterate that Musick concerns making the reactor become non-functional or barely functional so that design limits are not exceeded and does not provide for optimal reactor performance.

## **ii) Claims 32-39**

Claims 32-39, dependent upon claim 31, are patentable at least for the reasons stated above with respect to claim 31 as well as on their own merits.

**C. Appellants traverse the rejection of claims 40-41 under  
35 U.S.C. § 102b as being anticipated by Takeuchi.**

Claims 40 and 41 rise and fall together.

**i) Claim 40**

In maintaining his art grounds of rejection in the Examiner's Answer, the Examiner states on page 8:

The limitation, "transfer function representing functional relationships between independent control variables and the dependent performance variables" reads on the algorithm that functionally relates the independent variables (e.g., pressure level) to the dependent variables (e.g., plant abnormal condition).

Stated another way, the Examiner is reading the transfer functions recited in claim 40 on pre-programmed relationships in the algorithm of Takeuchi. By contrast, claim 40 recites "generating transfer functions ...." Simply put, Takeuchi does not generate transfer functions. At best, Takeuchi uses predefined relationships, but does not "generate transfer functions based on the sets of independent control variable values and the sets of dependent performance variable values, the transfer functions representing functional relationships between the independent control variables and the dependent performance variables," as recited in claim 40. It should also be noted that claim 40 recites obtaining the dependent

performance variables from simulations, and this limitation in conjunction with the generation of transfer functions is also missing from Takeuchi.

**ii) Claim 41**

Claim 41, dependent on claim 40, is patentable at least for the reasons stated above with respect to claim 40.

**D. Appellants traverse the rejection of claims 40-41 under 35 U.S.C. § 103 as being anticipated by Musick in view of Takeuchi.**

Claims 40 and 41 rise and fall together.

**i) Claim 40**

As demonstrated above, Musick and Takeuchi do not disclose or suggest an optimization process, and therefore, when combined can not disclose or suggest the optimization process recited in claim 40.

Furthermore, in rejecting claim 40 on this art grounds, the Examiner relies on Takeuchi as teaching the claimed optimization process, and asserts it would have been obvious to have combined Takeuchi with Musick. As discussed above, Takeuchi does not disclose many of the limitations in claim 40. Therefore, even assuming that one skilled in the art

would have combined Takeuchi with Musick, the resulting combination does not provide for the optimization process recited in claim 40.

Also, the reason given by the Examiner as to why one skilled in the art would combine the teachings of Takeuchi with Musick is not understood by Appellants. Musick is a protection system to prevent a reactor from achieving a dangerous operating condition. If Takeuchi was combined with Musick so that simulated (rather than actual) data was used by Musick as suggested by the Examiner,<sup>5</sup> this would defeat the intended purpose of Musick.

Accordingly, Musick in view of Takeuchi would not have rendered claim 40 obvious to one skilled in the art.

## **ii) Claim 41**

Claim 41, dependent on claim 40, is patentable at least for the reasons stated above with respect to claim 40.

## **X. CONCLUSION:**

Appellants respectfully request the Board to reverse the Examiner's anticipation and/or obviousness rejections of claims 31-41.

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<sup>5</sup> See page 10 of the March 11, 2004 Office Action

*Reply Brief Under 37 C.F.R. § 41.41*  
*U.S. Application No.: 10/608,086*  
*Atty. Docket: 24GA5998-7 (HDP Ref: 8564-000045/US/DVA)*

The Commissioner is authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,  
HARNES, DICKEY, & PIERCE, P.L.C.

By: \_\_\_\_\_

Gary D. Yacura  
Reg. No. 35,416

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**CLAIMS APPENDIX**

**Claims 31-41 on Appeal:**

Claim 31. A method of determining independent control variable values for a nuclear reactor under operation, comprising:

receiving state-point data for the operating nuclear reactor, the state-point data including current values for independent control variables and for dependent performance variables of the operating nuclear reactor; and performing an optimization process on one of a computer and computer network based on the received state-point data to generate one or more independent control variable values.

Claim 32. The method of claim 31, further comprising:

receiving a change in at least one constraint of the nuclear reactor operation; and wherein

the performing step performs the optimization process on one of a computer and computer network based on the received state-point data and the at least one changed constraint.

Claim 33. The method of claim 32, further comprising:

executing the performing step in response to receiving state-point data that differs from previously received state-point data.

Claim 34. The method of claim 31, further comprising:

executing the performing step in response to receiving state-point data that differs from previously received state-point data.

Claim 35. The method of claim 31, further comprising:

repeating the receiving and performing steps throughout operation of the operating nuclear reactor.

Claim 36. The method of claim 35, further comprising:

executing the performing step in response to receiving state-point data that differs from previously received state-point data.

Claim 37. The method of claim 31, further comprising:

displaying at least a portion of the state-point data.

Claim 38. The method of claim 37, further comprising:

displaying at least a portion of results from the performing step.

Claim 39. The method of claim 31, further comprising:

displaying at least a portion of results from the performing step.



Claim 40. The method of claim 31, wherein the optimization process comprises:

first simulating nuclear reactor operation for sets of independent control variable values to produce associated sets of dependent performance variable values;

generating transfer functions based on the sets of independent control variable values and the sets of dependent performance variable values, the transfer functions representing functional relationships between the independent control variables and the dependent performance variables; and

determining a set of independent control variable values for possible use in operating the operating nuclear reactor using the transfer functions.

Claim 41. The method of claim 40, wherein the first simulating step comprises:

treating the independent control variable values and the dependent performance variable values in the state-point data as a base set of independent control variable values and a base set of dependent performance variable values, respectively;

generating, from the base set of independent control variable values, modified sets of independent control variable values associated with each

independent control variable in a selected group of independent control variables; and

simulating nuclear reactor operation for each of the modified sets of independent control variable values to produce modified sets of dependent performance variable values.